

**INCH-POUND**

**MIL-W-46374F**

**14 OCTOBER 1991**

**SUPERSEDING**

**SEE 6.11**

## **MILITARY SPECIFICATION**

### **WATCH, WRIST. GENERAL PURPOSE**

This specification is approved for use by all Departments and Agencies of the Department of Defense.

#### **1 SCOPE**

1.1 Scope This specification covers mechanical and mechanical/quartz wrist watches intended for general use

1.2 Classification Watches shall be of the following types and colors, as specified (see 6.1 and 6.3)

##### **Types**

- 1 - Mechanical analog, fifteen jewel, maintainable
- 2 - Mechanical analog
- 3 - Quartz analog with battery installed
- 4 - Quartz analog, battery out of watch but packed with watch
- 5 - Quartz analog, battery not included with watch
- 6 - Navigators

##### **Colors**

- M - Silvery metallic  
B - Black

**Bennificial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to : Commander, U S. Army ARDEC, ATTN SMCAR-BAC-S, Picatinny Arsenal, New Jersey 07806-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.**

**AMSC N/A**

**DISTRIBUTION STATEMENT A**

**FSC 6645**

**Approved for public release; distribution is unlimited**

## 2. APPLICABLE DOCUMENTS

### 2.1 Government documents.

2.1.1 Specifications, standards and handbooks The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2)

### SPECIFICATIONS

#### Federal

PPP-T-360 Time Measuring Instruments, Packaging Of  
 PPP-B-566 Boxes, Folding, Paperboard  
 PPP-B-636 Box, Shipping, Fiberboard  
 PPP-B-676 Boxes, Setup

#### Military

MIL-I-45607 Inspection Equipment, Acquisition, Maintenance  
 And Disposition Of  
 MIL-S-46383 Strap, Wrist Instrument

### STANDARDS

#### Federal

FED-STD-313 Material Safety Data Sheets, Preparation And  
 The Submission Of  
 FED-STD-595 Colors

#### Military

MIL-STD-109 Quality Assurance Terms and Definitions  
 MIL-STD-129 Marking for Shipment and Storage  
 MIL-STD-810 Environmental Test Methods And Engineering  
 Guidelines

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 )

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein Unless otherwise specified, the issues are those cited in the solicitation.

## CODE OF FEDERAL REGULATIONS

### Nuclear Regulatory Commission, Rules and Regulations

#### Title 10 - Chapter I, Parts 30 and 32

(Applications for copies should be addressed to Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

2.2 Non-Government publications The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

##### ASTM D4181 - Materials, Acetal (POM) Molding and Extrusion

(Application for copies should be addressed to the American Society for testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187 )

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other information services.)

2.3 Order of precedence In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3 REQUIREMENTS

3.1 Qualification The watches furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products List at the time of award of contract (see 4.3 and 6.8).

3.2 Design and construction Watches shall have a plastic or corrosion resistant steel case and a strap. A stem set movement shall drive luminous concentrically mounted hour and minute hands around a 12 hour dial having luminous vials. The watch design shall be such that parts will not loosen in service. Figures forming a part of this specification are intended for guidance in physical and dimensional detail. Alternative designs and dimensional deviations are permissible but subject to prior Contracting Activity approval.

3.2.1 Materials. All materials shall be of a uniform quality and free from any defects which might impair the function, accuracy, wear resistance or safety. Material which is not specified by a definite material specification shall be of a composition and quality that will enable the watch to meet all applicable requirements of this specification.

**3.2.1.1 Self-luminous features.** Self-luminous features shall be luminous vials consisting of glass encapsulated phosphor with the hydrogen isotope tritium, in gaseous form, as an exciter. Vials shall contain not more than one percent of tritium oxide and not more than six percent total impurities. Any watch shall contain no more than 25 millicuries of tritium. The tritium vials shall be incorporated to account for no more than 5 millicuries per hand and 15 millicuries per dial.

**3.2.1.2 Nuclear Regulatory Commission license.**

**3.2.1.2.1 Manufacturer.** At the time of award of contract, the manufacturer must possess a valid U.S. Nuclear Regulatory Commission (NRC) License or Agreement State Byproduct Material License in compliance with 10 CFR 32.22, which authorizes possession of sufficient elemental tritium to fulfill contract requirements, and authorizes manufacture of radioactive instruments and articles (i.e., watches). This applies only to watches manufactured in locations where either NRC or Agreement State Licenses are required. A copy of the license shall be submitted to the qualifying activity prior to qualification approval and to the contracting officer prior to award of contract.

**3.2.1.2.2 Distributor.** At the time of award of contract, the company that will distribute these watches to the Government must possess a valid U.S. NRC License under 10 CFR 32.22, or Agreement State Byproduct Material License, which authorizes possession and distribution to the general public of the contracted watches as license exempt. A copy of the license shall be submitted to the qualifying activity prior to qualification approval and to the contracting officer prior to award of contract.

**3.2.1.3 Toxicity.** The finished product covered by this specification shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate departmental medical service who will act as an advisor to the contracting agency.

**3.2.2 Protective finish.** All metal parts, which are susceptible to corrosion and not protected by a lubricant, shall be treated with a protective finish or preservation except those parts whose proper functioning would be detrimentally affected.

**3.2.3 Movements**

**3.2.3.1 Movement and manufacturer identification.** At the time of application for qualification, the watch manufacturing or distributing source of supply shall submit to the activity identified in 6.8 the name and plant address of the manufacturer of the actual movement employed in the finished watch and the caliber and similarly descriptive movement identification. Any change in movement manufacturer or plant address of the manufacturer or choice of movement employed in the watch design without first alerting the qualifying activity identified in 6.8 accordingly, shall be cause for immediate removal from the Qualified Products List.

### 3.2.3.2 Type 1 and 2 mechanical watches.

3.2.3.2.1 Mechanical watch movement The movement shall be stem wound and stem set, with the stem located at the 3 o'clock position of the dial.

3.2.3.2.1.1 Diametric measurement. The maximum diametric measurement of the movement of type 1 mechanical jeweled watch shall be not less than 0.933 inch or greater than 1.025 inches.

3.2.3.2.2 Mainspring. When fully wound, the mainspring shall drive the complete movement a minimum of 36 hours without rewinding. The material for the mainspring shall be a corrosion resistant "nonbreakable" or cobalt base alloy.

3.2.3.2.3 Hairspring and balance wheel assembly. The movement shall have a temperature compensated hairspring and a solid monometallic non-magnetic balance wheel. The hairspring and balance wheel shall be material that in combination will not be affected functionally in the presence of the magnetic field specified in 3.3.8.

3.2.3.2.4 Movement design approval At the time of qualification testing, movement design of Types 1 and 2 watches shall be reviewed by and subject to the approval of the Government (see 6.10). Manufacturer drawings, specifications, sample movements, and supporting data, as applicable, shall be submitted for Government approval in accordance with 4.8. Data submitted shall be of sufficient detail to allow complete review of movement design, including all dimensions, jewel bearing locations and functional components. Absence of such data shall necessitate submission of sample movements at the discretion of the Government.

### 3.2.3.3 Type 1 mechanical jeweled watch

3.2.3.3.1 Second hand stop mechanism. Pulling the stem to the setting position shall result in stopping of the movement. Rotation of the stem shall permit the minute and hour hand to be advanced without any movement of the second hand. The depressing of the stem shall result in complete operation of the movement and hands.

3.2.3.3.2 Escapement The pallet and escape wheel shall be steel. The pallet shall contain jewels.

3.2.3.3.3 Jewel bearings The movement shall have a minimum of fifteen functional jewel bearings located at bearing points most essential to reduce friction and wear of the train and escapement parts. Jewels shall be solidly secured in the plate or bridge by friction fit. The jewel bearing material shall be of synthetic sapphire or equal. See 6.10.1.

3.2.3.3.4 Regulator. The movement shall be provided with a regulator. The regulator shall be at the midpoint of adjustment (within  $\pm 20\%$  of its total range of adjustment), when the watch is subjected to the accuracy tests specified in 4.7.19.

3.2.3.3.5 Female stem. The female stem shall be fabricated of corrosion resistant steel and when joined with the male stem, shall result in the complete stem functioning as an assembly. It shall be dimensioned so that the face of the female

section will be outside of the case sleeve when the stem is in the winding position, and locked within the male stem inside of the case sleeve (for the full length of motion from winding to setting), when in the setting position. The female stem shall be so dimensioned as to locate the joint between the male and female stems inside of the sleeve when the stem is in the setting position. It shall also enable the movement to drop out of the watchcase when the female stem is in the winding position.

#### 3.2.3.4 Types 3 through 6 quartz watches

3.2.3.4.1 Quartz watch movement. The movement shall be battery powered quartz and be stem set with the stem located at the 3 o'clock position of the dial. Pulling the stem to the setting position shall result in stopping the movement. Rotation of the stem shall permit the minute and hour hand to be advanced without any movement of the second hand. Depressing the stem shall result in complete operation of the movement and hands.

3.2.3.4.2 Power. The watch shall be powered by a self contained power cell which is commercially available from a minimum of two manufacturers. The watch shall be designed to operate a minimum of 2-1/2 years. The power cell shall contain orientation marks which identify the positive (+) side.

3.2.3.4.3 Internal. The spring used for power cell contacts shall be phosphor bronze or equivalent. The negative contact for the power cell shall be plated 0.1 micron thickness of bright gold. The positive power cell contact shall be either nickel plated stainless steel or plated bright gold 0.1 micron in thickness.

#### 3.2.4 Design of dials and hands

3.2.4.1 Dimensions, dial and hands. Figures 1 and 2 indicate dimensions preferred for dial and hands. Alternative designs will be permissible but subject to the approval of the Qualifying Activity.

3.2.4.2 Application of self-luminous sources. Areas designated in Figures 1 and 2 as "luminescent green" indicate required position of glass vial encapsulated tritium.

3.2.4.3 Dial markings. Markings on dials shall be in accordance with Figure 1. Manufacturer symbols or identification shall not appear on the dial.

#### 3.2.5 Case assembly and design.

3.2.5.1 Case dimensions. Figure 3 indicates preferred case dimensions. Alternate designs shall be permissible but will be subject to the approval of the Qualifying Activity.

3.2.5.1.1 Case, types 3, 4, 5, 6. Case design shall allow access for battery servicing.

3.2.5.2 Case markings. The back of each case shall be marked with the data required by Figure 4. The marking of the month shall be the first three letters of the month and the marking of the year shall be the year in full, e.g., December 1986 would be "DEC 1986". Preferred dimensions of markings are indicated. Variations shall be permissible but subject to the approval of the Qualifying Activity.



3.2.5.2.1 Type 1. The date (month and year) to be included in the identification shall be the date of acceptance of the watch by the Government. The serial numbers will be assigned by the contractor (see 6.2). Serial numbers of rejected watches shall not be repeated. The manufacturer's name and model or grade number shall be marked on the movement (barrel bridge, train bridge or both).

3.2.5.2.2 Types 2, 3, 4, 5, 6. The date (month and year) to be included in the identification shall be the date of manufacture.

3.2.5.3 Case material. The case shall be fabricated of acetal plastic material in accordance with ASTM D4181, Type POM 131, or of corrosion resistant steel.

3.2.5.4 Case finish and color. All visible exterior metal or plastic surfaces of the case assembly, excluding control switches and spring type case bars shall have a dull nonspecular/nonreflective finish. The color shall be silvery metallic or black (color number 37038) of FED-STD-595 as specified in the ordering data (6.3). See also 6.7.

3.2.5.5 Case bars. Watch cases shall include either integral bars or stainless steel removable spring bars for the watch strap. The case/spring bars shall be designed to accommodate a MIL-S-46383 strap and shall be capable of withstanding a static pull on the strap of up to  $15 \pm 1/2$  pounds on each bar without damage as specified in 4.7.6.5.

3.2.6 Crystal. The crystal shall be made of tempered glass, mineral crystal or nonhygroscopic, thermosetting plastic. The crystal shall be transparent, uncolored, and free from bubbles, striae, scratches, chips, or other imperfections which may interfere with reading the watch. The crystal shall be fabricated in such a manner as to be similar in design to Figure 3 and shall properly fit the case.

3.2.6.1 Crystal strength. The crystal, when assembled to the case, shall show no evidence of cracking or chipping when tested as specified in 4.7.7.1.

3.2.7 Strap. The strap shall be in accordance with MIL-S-46383, Type II. The color number shall be black (color number 37038) of FED-STD-595 or as specified (see 6.2). See also 6.7.

3.2.8 Crown. Watch crowns shall have a straight knurl and conform to the dimensions of Figure 3.

3.2.9 Elapsed time ring, type 6

3.2.9.1 Design. The elapsed time ring shall be designed to assure that the outer edge (shoulder) of the crystal is recessed within the elapsed time ring, and shall include detail, hour and minute graduations, numerals, and markings in accordance with Figures 5 and 6. Dimensional deviation from Figures 5 and 6 is permissible but subject to the approval of the Qualifying Activity.

3.2.9.2 **Torque.** The elapsed time ring shall move only when a torque of  $26 \pm 6$  inch-ounces is applied

3.2.9.3 **Displacement.** The elapsed time ring shall be capable of withstanding, without damage, two forces, each of  $10 \pm 1/2$  pounds applied to the lower side of the elapsed time ring with the index (triangle) at the 3 o'clock position

### 3.3 **Performance.**

3.3.1 **Vibration.** While running, the watch shall not be damaged and shall pass the radiological requirements after 60 minutes of composite vibrations at amplitudes of (0.3 – 0.7 – 0.3 mm). The frequencies shall be varied uniformly between 30 Hz to 60 Hz and 30 Hz for 20 minutes each of the directions stated in 4.7.22.

3.3.2 **Shock.** The watch shall show no evidence of damage affecting serviceability and shall pass the radiological requirements after the shock test specified in 4.7.23.

3.3.3 **Storage** The watch shall show no evidence of damage affecting serviceability and shall pass the radiological requirements after being subjected to storage temperature test specified in 4.7.24. This criteria pertains to mechanical and radiological performance, therefore the battery should be removed from the quartz watch during the test. Batteries used for powering a quartz watch degrade considerably if stored at the temperature extremes

3.3.4 **Water resistance** The watch shall show no evidence of leakage after being subjected to the test specified in 4.7.25

3.3.5 **Synchronization** The hands shall be synchronized to eliminate the possibility of error in reading correct time. The hour hand shall indicate the correct time within  $\pm 1$  dial graduation when the minute hand is at 12

3.3.6 **Setting** The crown shall be capable, while being moved from the running to set position, of withstanding a pull of 5 pounds  $\pm 0.25$  lb (see 4.7.13)

3.3.6.1 **Mechanical watch** The minute hand shall not rotate (jump), at its tip, more than one tip width when the crown is moved from the setting position to the winding position after setting the hands

3.3.6.2 **Quartz watch** When the crown is pulled in the setting position the mechanism is mechanically stopped. When the stem is pushed in the watch shall start immediately.

3.3.7 **Winding torque, type 1 and 2** When fully wound, the mechanical watch shall not be damaged when a torque of  $6 \pm 0.5$  inch-ounces is applied to the crown (see 4.7.12).

### 3.3.8 **Magnetism.**

3.3.8.1 **Magnetism, types 1 through 5.** While running, the watch shall not be adversely affected when subjected to a 14.5 to 15.5 gauss magnetic field, as specified in 4.7.21.1, and shall subsequently meet the requirements of 3.3.11.



**3.3.8.2 Magnetism, type 6.** While running, the watch shall not be adversely affected when subjected to  $125 \pm 1$  gauss magnetic field, as specified in 4.7.21.2, and shall subsequently meet the requirements of 3.3.11

**3.3.9 Dark viewing.** The luminous features shall be of sufficient brightness so as to be readable in darkness while holding the watch no closer than 12 inches from the eyes of a dark-adapted observer having normal or corrected 20/20 vision. Luminosity shall be uniform for visible dials. There shall be no indication of dead or dim vials.

**3.3.10 Isochronism.** Watches shall pass the test for isochronism specified in 4.7.20, in a dial-up position at  $75F \pm 3F$  ( $23.9C \pm 1C$ )

**3.3.10.1 Type 1.** The variation in rate (see 6.5.4), shall be recorded every 6 hours for a period of 24 hours and shall not exceed 5 seconds from the rate recorded in the previous 6 hour period. The watches shall be fully wound prior to testing and shall not be wound during the test.

**3.3.11 Accuracy.** After meeting the requirements of 3.3.1 to 3.3.10 inclusive (as applicable to the type watch), the mean daily rates (see 6.6.6) of the watch in each of the two positions of (1) dial-up and (2) crown-down shall not exceed the following values at the temperatures specified

Temperature (In Degrees)	Mean Daily Rate (Seconds Per Day)		
	Type 1	Type 2	Type 3 and 6
$40 \pm 2F$ ( $4.4 \pm 1.1C$ )	$\pm 60$	$\pm 120$	$\pm 3$
$75 \pm 2F$ ( $23.9 \pm 1.1C$ )	$\pm 30$	$\pm 60$	$\pm 0.7$
$125 \pm 2F$ ( $51.7 \pm 1.1C$ )	$\pm 60$	$\pm 120$	$\pm 3$

### **3.3.12 Radiological.**

**3.3.12.1 Contamination.** Complete watches shall be tested for contamination after having been subjected to 3.3.1, 3.3.2, and 3.3.3. They shall be wiped as specified in 4.7.2.3.1. Each resulting wipe shall indicate a removable contamination level of not more than 100 disintegrations per minute (dpm).

**3.3.12.2 Contamination, long term.** Complete watches shall be packaged in accordance with 5.1.2 for a period of not less than 30 days. They shall then be wiped in accordance with 4.7.2.3.1. The results shall indicate removable contamination of not more than 100 dpm.

**3.3.12.3 Diffusion.** Completed watches, with all luminous vials installed, shall be submerged in a measured volume of distilled or deionized water, equal to approximately 10 times the volume of the watch, for 24 hours at  $73F \pm 3F$  ( $23C \pm 1C$ ). The diffusion of contamination into the water shall not exceed 50 nanocuries per 24 hour period, when tested as specified in 4.7.2.3.2.

**3.3.13 Long term accuracy (qualification only).** Accuracy will be determined during a 90 day period as specified in 4.6.27. During the 90 day period of operation, watches shall be subjected to shock and vibration after 30 days and 60 days of operation in accordance with 3.3.1 and 3.3.2, except that duration of vibration shall be for only five (5) minutes in each direction. Watches shall meet the following criteria:

	Average Mean Daily Rate (Seconds Per Day)	Mean Daily Rate (Seconds Per Day)
Type 1	36	60
Type 2	72	120
Type 3 thru 6	2.4	4

**3.3.14 Altitude, type 6** Watches shall show no evidence of damage or adverse effect on operation when subjected to an altitude of 35 000 feet for a minimum of 60 minutes

**3.3.15 Salt fog, type 6** Watches shall show no evidence of damage to the crystal or adverse effect upon operation after having been subjected to salt atmosphere in accordance with 4.7.29

**3 3 16 Human perspiration resistance, type 6** Watches shall show no evidence of corrosion, discoloration, or staining after having been subjected to an accelerated lactic acid test in accordance with 4 7.30

**3 4 Workmanship** All parts shall be finished so the case and the crown shall have no sharp edges or corners which could cause skin cuts or abrasions. All lugs from tip of lug to body of bezel shall have sharp edges and corners rounded to avoid skin abrasion. Rounded edges and corners shall be reasonably uniform in appearance.

**3 4.1 Assembled vials.** All luminous vials, after final assembly of the watch, shall be free from extraneous paint, adhesive or other foreign materials which could reduce luminosity.

**3 5 Interchangeability, type 1.** All like parts shall be interchangeable in all watches of one model furnished by one manufacturer, and shall not adversely affect timekeeping exclusive of minor adjustments. The hairspring and balance wheel assembly shall be interchangeable as a unit.

**3.6 Operating instructions** An operating instruction shall be furnished with each watch. This instruction shall describe all the functions of the watch, the durability (i.e., shock and water resistance features), life expectancy, and accuracy that can be expected from the watch, type battery, and any precautions that should be observed during the life of the watch (See 5.3).

**3.7 Safety data sheet.** Since this specification describes a product which contains a hazardous (radioactive) material, material safety data sheets shall be prepared in accordance with FED-STD-313 (See 6 2 1)

#### 4. QUALITY ASSURANCE PROVISIONS.

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain performance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (See 4.3)
- b. Quality conformance inspection (See 4.4)

4.3 Qualification inspection. Qualification inspection shall consist of testing, and material certifications as applicable, for all the requirements specified in Sections 3 and 5.

4.3.1 Qualification sample. A quantity of 20 watches shall be submitted for qualification testing as directed by the activity identified in 6.8. Testing shall be performed at a laboratory facility acceptable to the Government. Sample watches submitted for testing shall be derived from normal production and be indicative of normal production equipment and procedures. Ten of the watches shall be packaged in accordance with 5.1.2. The twenty watch samples shall be identified by an attached tag containing the following information:

- a. Sample for Qualification Tests
- b. Submitted by (name) (date) for qualification tests in accordance with requirements of MIL-W-46374 under authorization (reference letter authorizing test).
- c. Manufacturer's model, grade number or part number.
- d. Name of manufacturer.

4.3.2 Retention of qualification (applicable to the qualifying activity only). To retain qualification, the contractor shall forward a report at 6-month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting date. The report shall consist of:

a.. A summary of the results of the tests performed for inspection of product for delivery (Table IV), indicating as a minimum the number of lots that have passed, the number that have failed, and the group which they failed. The results of tests of all reworked lots shall be identified and accounted for.

b. A summary of the results of tests performed for periodic inspection (Table II), including the number and mode of failures. The summary shall include results of all periodic inspection tests performed and completed during the 6-month period. If the summary of the test results indicates nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the Qualified Products List.

Failure to submit the report within 30 days after the end of each 6-month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the contractor shall immediately notify the qualifying activity at any time during the 6-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification.

In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during two consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit his qualified products to testing in accordance with the qualification inspection requirements and the reason for no production.

4.4 Quality conformance inspection. Inspections shall be performed in accordance with inspection provisions set forth herein. The characteristics shown in Tables I, II, III and IV, and requirements for packaging and marking set forth in 4.5.3.7 shall constitute minimum inspections to be performed by supplier prior to Government acceptance or rejection by item or lot.

#### 4.5 Inspection provisions

4.5.1 General provisions. The quality assurance provisions of this specification and of other documents referenced herein form the basis for inspection to be performed by the supplier. Quality assurance terms and definitions shall apply as defined in MIL-STD-109.

4.5.2 Submission of product. Unless otherwise specified herein or by the contracting officer, inspection lot size, lot formation, and presentation of lots shall be in accordance with the contract or purchase order.

4.5.3 Examination and tests. Examination and tests related to section 3 herein, shall be performed on an individual characteristics basis and the inspection level and sampling

shall be as specified in the contract or purchase order. Examination and tests for packaging, packing and marking shall be in accordance with PPP-T-360. The Government reserves the right to inspect for any applicable requirement and to reject individual nonconforming items.

4.5.3.1 Certifications. Certifications for characteristics specified in Table I below shall include test data and results specified. Certification shall be provided prior to performing inspections in accordance with Tables and shall suffice for Government acceptance throughout contract, providing the materials, finishes, manufacturing processes, and techniques used to produce the items for which certification was issued have not been changed or revised. Any and all changes will require a new certification from the contractor. Certification does not relieve contractor of the responsibility for inspection of characteristics, and recording data and results therefrom. Recorded data results shall be made available to the Government upon request. When defects or inferior quality is detected, and the Government deems a material or finish analysis necessary, the contractor will be required to submit data, samples, or specimens to the contracting officer for analysis and approval.

TABLE I Conformance Inspection Certifications

CHARACTERISTIC	REQUIREMENT		
	<u>Type 1</u>	<u>Type 2</u>	<u>Types 3, 4, 5, 6</u>
Materials	3.2.1	3.2.1	3.2.1
Self-luminous features	3.2.1.1	3.2.1.1	3.2.1.1
NRC License	3.2.1.2	3.2.1.2	3.2.1.2
Toxicity	3.2.1.3	3.2.1.3	3.2.1.3
Protective finishes	3.2.2	3.2.2	3.2.2
Diametric measurement	3.2.3.2.1.1	-----	-----
Mainspring	3.2.3.2.2	3.2.3.2.2	-----
Hairspring and balance wheel assembly	3.2.3.2.3	3.2.3.2.3	-----
Escapement	3.2.3.3.2	-----	-----
Jewel bearings	3.2.3.3.3	-----	-----
Regulator	3.2.3.3.4	-----	-----
Power	-----	-----	3.2.3.4.2

TABLE I. Conformance Inspection, Certifications (continued)

CHARACTERISTIC	REQUIREMENT		
	Type 1	Type 2	Types 3, 4, 5, 6
Internal	-----	-----	3.2.3 4.3
Case (Material)	3.2.5.3	3.2.5.3	3.2.5.3
Crystal	3.2.6	3.2.6	3.2.6
Strap	3.2.7	3.2.7	3.2.7
Interchangeability	3.5	-----	-----

4 5 3 2 Quality conformance inspection, radiological shall be in accordance with Table II

TABLE II Conformance Inspection, Radiological (Types 1 through 6)

Watch Lot sizes for inspection of installed gaseous tritium filled glass vials of completed watches, hour hands, minute hands, or second hands shall be not less than 500.

CHARACTERISTICS	REQUIREMENT	TEST
Contamination	3 3 12 1	4 7 2.3 1
Diffusion	3 3 12.3	4 7.2 3 2

4 5 3 3 Quality conformance inspection, materials and design Quality conformance inspection, materials and design shall be in accordance with Table III



TABLE III Conformance Inspection, Materials and Design

CHARACTERISTIC	REQUIREMENT				TEST
	Type 1	Type 2	Types 3, 4, 5	Type 6	
Movement manufacturer and design	3 2 3 1	3 2 3 1	-----	-----	4 7.3
Mechanical Watch Movement	3 2 3.2.1	3 2 3 2 1	-----	-----	4 7.1
Second hand stop mechanism	3 2 3 3.1	-----	-----	-----	4 7.13.2
Jewel Bearings	3 2 3 3 3	-----	-----	-----	4 7.3.1
Female stem	3 2 3 3 5	-----	-----	-----	4 7.1
Quartz watch movement	-----	-----	3 2 3.4.1	3 2 3 4 1	4 7.1
Dimensions, dials and hands	3 2 4 1	3 2 4 1	3 2 4 1	3 2 4.1	4 7.4 & 4 7 5
Application of self-luminous sources	3 2 4 2	3 2 4 2	3 2 4 2	3 2 4.2	4 7 1
Dial markings	3 2 4 3	3 2 4 3	3 2 4 3	3 2 4 3	4 7 4
Case dimensions	3 2 5 1	3 2 5 1	3 2 5 1	3 2 5 1	4 7 6.3
Case, types 3 - 6	-----	-----	3 2 5.1 1	3 2 5 1 1	4 7 17
Case markings	3 2 5 2	3 2 5 2	3 2 5 2	3 2.5.2	4 7 17
Type 1	3 2.5.2 1	-----	-----	-----	4 7.17
Types 2 - 6	-----	3 2 5 2 2	3 2.5.2.2	3 2.5.2.2	4 7.17
Crown	3 2 8	3 2 8	3 2.8	3 2.8	4 7.8
Elapsed Time Ring	-----	-----	-----	3 2 9	4 7.3.1
Workmanship	3 4	3 4	3 4	3 4	4 7.18
Assembled vials	3 4.1	3 4.1	3 4 1	3 4 1	4 7.2.2
Operating instructions	3 6	3 6	3 6	3 6	5 3
Safety data sheet	3 7	3 7	3 7	3 7	Submission

TABLE IV Conformance Inspection Performance

CHARACTERISTIC	REQUIREMENT			TEST
	Type 1	Type 2	Types 3, 4, 5	Type 6
Mainspring	3 2 3 2 2	3 2 3 2 2	-----	-----
Vibration	3 3 1	3 3 1	3 3.1	3 3.1
Shock	3 3 2	3 3 2	3 3.2	3 3.2
Storage	3 3 3	3 3 3	3 3.3	3 3.3
Water resistance	3 3 4	3 3 4	3 3.4	3 3.4
Synchronization	3 3 5	3 3 5	3 3.5	3 3.5
Setting	3 3.6	3 3.6	3 3.6	3 3.6
	3 3.6 1	3 3.6 1	-----	-----
	-----	-----	3 3.6.2	3 3.6.2
Winding torque	3 3 7	3 3 7	-----	-----
				4 7.11 & 4 7.12
Magnetism	3 3.8 1	3 3.8.1	3 3.8.1	3 3.8.2
Dark viewing	3 3 9	3 3 9	3 3.9	3 3.9
Accuracy	3 3 11	3 3 11	3 3.11	3 3.11
Altitude	-----	-----	-----	3 3.14
Salt Fog	-----	-----	-----	3 3.15
Human Perspiration Resistance	-----	-----	-----	3 3.16

**4.5.3.4 Qualification inspection.** Qualification inspection shall be in accordance with Tables I through V. The Table V tests however are exclusive to Qualification inspection.

TABLE V Qualification, Types 1 through 6.

CHARACTERISTIC	REQUIREMENTS	TEST
Movement, design and approval	3.2.3.2.4	4.8
Contamination, long term	3.3 12.2	4.7.26
Accuracy, long term	3.3.13	4.7.27

**4.5.3.5 Noncompliance.** If a sample fails to pass Table II inspection, the contractor shall immediately notify the cognizant Contracting Activity of such failure and take corrective action on the materials or processes, or both, and on all units of product which can be corrected and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the Contracting Activity has been taken. After the corrective action has been taken, Table II inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the Contracting Activity). Table IV inspections may be reinstituted, however, final acceptance and shipment shall be withheld until the Table II inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection and qualifying activities.

**4.5.3.6 Packaging and marking inspection.** Examination and tests for packaging, packing, and marking shall be in accordance with Section 5 and PPP-T-360.

**4.6 Inspection equipment and facilities.** The contractor shall insure that test and inspection facilities of sufficient accuracy, quality and quantity are established and maintained in accordance with MIL-I-45607 to permit performance of required inspections. The Government reserves the right to use the test equipment for its own independent inspections to the extent that such use will not unduly interfere with the contractor's delivery schedule.

**4.6.1 Accuracy.** Accuracy of the watch shall be determined by a mechanical, electric, or electronic time measuring instrument having an accuracy of  $\pm 2$  seconds per day for testing the mechanical watch and  $\pm .025$  seconds per day for testing the quartz watch as determined by a primary time standard.

**4.6.2 Contractor provided inspection equipment.** The contractor shall provide inspection equipment compatible with the "Test Methods and Procedures" specified in 4.7 of this specification.

**4.6.3 Diffusion test - accuracy and procedures.** The contractor analysis of tritium content in the diffusion test shall be made with a liquid scintillation counter. The system calibration shall be established using quenched tritium standards available from the

National Institutes of Standards and Technology (NIST), or from a source that maintains traceability with NIST. Efficiencies of the unknown samples shall be established by the channels-ratio method, the external standards-ratio method, or the "H" number method of quench compensation. Total system plus standards errors in the standardization shall not be in excess of  $\pm 5$  percent. The liquid scintillation counting system shall have sufficient sensitivity to produce a lower limit of detection of 10 picocuries or less of tritium at 95 percent confidence level. The radioactivity of the standard source will be such so as to provide a 1 percent error at 95 percent confidence level in 1 to 10 minutes counting time. Counting time will be established so that the maximum error of the test shall not exceed 15 percent for samples at the 95 percent confidence level. The scintillation solution shall be an acceptable water soluble scintillation cocktail. The counting vials shall be a low potassium liquid scintillation borosilicate glass vial or polyethylene liquid scintillation vial. The samples shall be prepared in the same type of vial as the quench standards; otherwise, a correction factor shall be calculated so that correct results will be obtained despite the difference in vial construction.

4.7 Test methods and procedures. Unless otherwise specified herein, the tests shall be performed at 60 F (15.6 C) to 90 F (32.2 C), at barometric pressure of 28 to 31 inches of mercury and maximum relative humidity of 80 percent.

4.7.1 Materials and protective finishes. Compliance of materials and protective finishes to the requirements of 3.2.6, 3.2.7 and 3.2.8 shall be certified as set forth in 4.5.3.1. In addition, a visual inspection of component parts and assemblies shall be made to determine compliance with 3.2 and all associated requirements. Where defects of inferior quality is evident and the Government deems a material analysis necessary, the contractor will be requested to submit samples or specimens to the contracting officer for analysis and approval.

4.7.2 Luminous components

4.7.2.1 Certification. Glass vials shall be certified to meet the requirements of 3.2.1.1.

4.7.2.2 Visual. Assembled vials shall be inspected for compliance with 3.4.1.

4.7.2.3 Radiological

4.7.2.3.1 Contamination. A Metrical GN-6 or equivalent wipe, moistened with deionized or distilled water, shall be used to wipe the watches. All exterior surfaces of the completed watch shall be thoroughly wiped with the wipe. The wipe shall be placed in the liquid scintillation solution within one minute after wiping the watch. The amount of tritium on the wipe shall be determined using a liquid scintillation counting technique with accuracy and procedures as in 4.6.3. The test shall be performed by the contractor. The contractor shall furnish wipes, solution, and liquid scintillation vials. The scintillation solution and vials shall be as specified in 4.6.3. Results indicating removable contamination over the entire watch of more than 100 dpm shall constitute failure of this test.

4.7.2.3.2 Diffusion and water leakage. Completed watches with all the luminous sources installed shall be submerged in a measured volume of distilled or deionized water, equal

to approximately 10 times the volume of the watch, for 24 hours at  $73 \pm 3F$  ( $23 \pm 1C$ ). Watches shall be removed from the water. This is the test procedure for tritium diffusion, and if the radioactive content of the water exceeds 50 nanocuries/24 hour period, it shall constitute failure of the test. The watches also shall be examined for water leakage, and if there is water in the crystal bowl at the completion of the test, it shall constitute failure of the water resistance test. Failure of watches of either of these tests shall be cause for refusal by the Government to continue acceptance of the production watches until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiencies.

**4.7.3 Design and construction - movement.** Movement identity and design and construction, (stem mount and stem set) shall be determined prior to qualification testing for compliance with 3.2.3.

**4.7.3.1 Type 1 Jewel bearings** One percent of the watches under contract, but not less than three watches, shall be examined to insure the watch contains the appropriate number of jewels placed at the most critical friction points, and are in compliance with 3.2.3.3.3.

**4.7.3.2 Type 1 and 2 Regulator.** The regulator setting shall be checked after meeting the accuracy requirement of 3.3.11, to determine compliance with 3.2.3.3.4.

**4.7.3.3 Type 3 through 6 Module power drain tests** The module shall be tested to insure that the current drain allows an operating life as specified in 3.2.3.4.2. The module shall be measured with a current meter to determine the timekeeping current drain. To allow sufficient latitude in available power, the capacity of the power cell as measured in milliamp-hours (ma hours) shall be derated by 20 percent to obtain the net power capacity of the power cell. The comparison of power drain from the module to the power capacity of the derated power cell shall be made to insure that a minimum life of 30 months can be obtained from the power cell.

**4.7.4 Dial.** The dial shall be visually and dimensionally inspected for size of markings, legibility and finish in accordance with the respective requirements of 3.2.4 and Figure 1.

**4.7.5 Hands** The hour, minute and second hands shall be inspected for style, length, shape and finish in compliance with 3.2.4 and Figure 2.

**4.7.6 Case**

**4.7.6.1 Case material** The material (plastic or corrosion resistant steel) shall be certified as specified in 4.5.3.1 to determine compliance with 3.2.5.3.

**4.7.6.2 Case finish.** The plastic case shall be visually color matched to determine compliance with the color chip number per FED-STD-595 as specified in 3.2.5.4. Stainless steel cases shall be visually examined for a dull nonreflecting finish as specified in 3.2.5.4.

**4.7.6.3 Cases.** Cases shall be inspected visually and dimensionally to determine conformance to Figure 3 or acceptability to the Government.

4.7.6.4 Type 3 through 6 Case. The case shall be inspected visually and dimensionally to determine conformance to 3.2.5.1.1 and 3.2.5.4. (A physical test shall be applied where case parts are not capable of being removed to determine conformance to 3.2.5.1.1. The physical test shall consist of applying a force, or prying under normal pressure (equivalent of 8 to 10 pounds direct force) in such a manner that no marking or scarring of the case and case finish shall result.)

4.7.6.5 Case bar test. With the watch in a secured position and the strap held in a position that will not exert pressure on the buckle or the keeper of the strap, a pulling force of  $15 \pm 1/2$  pounds shall be applied to each case/spring bar via the strap without the case/spring bar permanently bending, loosening or causing damage to the case/spring bar or case assembly.

4.7.7 Crystal Crystals shall be examined before and after assembly to the case and after the storage temperature test of 4.7.24, to determine compliance with 3.2.7. Certification of the material shall be in conformance with 4.5.3.1.

4.7.7.1 Crystal strength test After assembly to the case, the case assembly including crystal shall be placed flat, crystal up, on a rubber sheet (0.5 mm or 0.02 inch thickness) placed on a horizontal, rigid nonresilient, metal surface. A solid steel sphere weighing  $0.55 \pm 0.05$  ounces ( $15.7 \pm 1.4$  grams) approximately 5/8 inch or 1.59 cm diameter) shall then be freely dropped so as to fall 12 inches (30.48 cm) before striking the crystal. Any visible damage to the crystal shall be cause for rejection.

4.7.8 Crown The crown shall be visibly examined and dimensionally checked for conformance with Figure 3 or acceptability by the Contracting activity

4.7.9 Strap The strap shall be accepted by certification (see 4.5.3.1) to insure compliance with 3.2.7.

4.7.10 Dark viewing A dark room shall be utilized to represent total darkness when conducting the visual examination under the conditions and distance specified in 3.3.9 to determine compliance therewith. Watches shall be in the dark room for at least eight hours prior to conducting examinations. Individual(s) performing test shall be acclimated to the dark room a minimum of 20 minutes prior to conduct of test. This test shall be performed no sooner than sixty days after vial installation

4.7.11 Winding, Type 1 and 2 The winding operation shall be smooth without excessive torque. Continuous winding shall not adversely affect the timekeeping qualities of the watch.

4.7.12 Winding torque, Type 1 and 2. The winding torque will be applied and measured with a torque gauge. When the watch is fully wound, the maximum torque specified in 3.3.7 shall be applied without any damaging effect to the watch.

4.7.13. Setting A standard type pull gauge with appropriate adapter shall be utilized to apply the direct force (pull) specified in 3.3.6. The crown shall not be damaged or separated from the movement when the direct force (pull) is applied.



**4.7.13.1 Hour-minute setting.** Six settings shall be made in 2-hour increments to insure compliance with 3.3.6.1 and 3.3.6.2.

**4.7.13.2 Second hand stop mechanism.** The second setting mechanism shall be activated for at least five different settings, to insure that a precise stop and start action can be obtained without adverse effect on the hands or movement, in accordance with 3.2.3.3.1.

**4.7.14 Hand synchronization.** The watch shall be examined to determine conformance with 3.3.5. The setting mechanism shall be activated and readings taken when the minute hand is at "12" and the hour hand is at the 3, 6, 9 and 12 hour respectively, to determine compliance with 3.3.5.

**4.7.15 Mainspring, Type 1 and 2.** With the watch fully wound, it shall be examined for continuous running, without rewinding, for the minimum time specified in 3.2.3.2.2.

**4.7.16 Hairspring and balance wheel assembly, Type 1 and 2.** The hairspring and balance wheel unit shall be considered acceptable for compliance with 3.2.3.2.3 if the watch is capable of meeting the requirements of 3.3.11.

**4.7.17 Identification marking.** All numbers and lettering shall be visually inspected for correctness, legibility, and application in accordance with 3.2.5.2, 3.2.5.2.1 and 3.2.5.2.2. Inspection for permanent marking shall insure that acceptable processes have been applied such as: castings, moldings, steel stamp, acid, etching, or engraving.

**4.7.18 Workmanship.** Quality of workmanship shall be in conjunction with best industry practices and shall be inspected by visual and tactile means at the discretion of the Government on the complete watch to insure that watches are continually produced in accordance with 3.4

**4.7.19 Accuracy.** During the conditioning period, the running watches shall be subjected to the test temperature for at least 4 hours prior to the test. Daily rates (see 6.5.5), shall be recorded for a period of three days in each position and the mean daily rate (see 6.5.6), determined therefrom. The watches shall be rejected if the mean daily rate (see 6.5.6), exceeds the requirements of 3.3.11. The Type 1 and 2 watches shall be wound at the beginning of each test and each 24 hours thereafter for the duration of the tests. The mean daily rate shall be determined by means of a master time source as specified in 4.6.1

**4.7.20. Isochronism.** This test shall be conducted concurrently with 4.7.19.

**4.7.20.1 Type 1.** This test shall vary from that in 4.7.19 in that the error shall be determined at 6-hour intervals. The difference of error recorded between each 6-hour period shall not exceed 5 seconds.

**4.7.20.2 Type 2.** In the position and at the temperature specified in 3.3.10, the watch shall be fully wound and operated for four hours. The watch shall again be fully wound and the rate recorded while fully wound and after four hours of operation. The rates shall again be recorded at the 20th and 24th hour. The difference in uniformity of rate between the four-hour periods shall not exceed 10 seconds.

**4.7.21 Magnetism.** A magnetic field shall be generated electrically utilizing standard test equipment capable of developing the magnetic intensity (in Gauss) within the limits specified in 3.3.8. With the watch running, it shall be placed into the energized field in the manner specified in 4.7.21.1 or 4.7.21.2 as applicable, with the stem parallel to the direction of the field. Upon completion and removal from the field, the watch shall be rated by a precision type rate recorder having an accuracy as specified in 4.6.1 to determine compliance with 3.3.8.

**4.7.21.1 Magnetism, types 1 through 5.** Watches shall be subject to the field specified in 3.3.8.1, with the field on for three seconds and off for three seconds. This cycle shall be repeated ten times.

**4.7.21.2 Magnetism, type 6.** Watches shall be subjected to the magnetic field specified in 3.3.8.2 for ten minutes.

**4.7.22 Vibration** The watch shall be vibrated in accordance with 3.3.1 as follows:

- 20 minutes with vibration perpendicular to dial
- 20 minutes with vibration in plane of dial and in direction from 12 to 6.
- 20 minutes with vibration in plane of dial and in direction from 9 to 3

**4.7.23 Shock** While running, the watch shall be dropped from the height of 50 centimeters (19.7 inches), uncontrolled, onto vinyl tile (3 mm or 1/8 inch thickness) affixed to a concrete block. At the conclusion of this test the watch shall be running and be subjected to a visual and tactile examination in compliance with 3.3.2 for any crystal damage or other loose, missing, and damaged parts. After passing this examination the watch shall then be subjected to the test in 4.7.24.

**4.7.24 Storage** In compliance with 3.3.3, subject the watches to ambient temperatures and time in the following order:

- Store at  $-50^{\circ}\text{F} \pm 2^{\circ}\text{F}$  ( $-45^{\circ}\text{C} \pm 1.1^{\circ}\text{C}$ ) for 24 hours
- Store at room temperature ( $60^{\circ}\text{F}$  to  $90^{\circ}\text{F}$  ( $15.5$  to  $32.2^{\circ}\text{C}$ )) for 24 hours.
- Store at  $140^{\circ}\text{F} \pm 2^{\circ}\text{F}$  ( $60^{\circ}\text{C} \pm 1.1^{\circ}\text{C}$ ) with at least 50 percent relative humidity for 24 hours
- Store at room temperature for 24 hours.

After exposure to each extreme temperature, the watch shall be examined for physical defects or damage. There shall be no evidence of physical defects, damage of watch, or imperfections of crystal. After passing this test the watch shall be subjected to and shall meet the requirements of 3.3.11.

**NOTE.** Type 1 and 2 watches shall not be run during storage tests. Temperature changes in the watch may be gradual to avoid thermal shock. Type 3 to 5 watches shall have the battery in the watch.

**4.7.25 Water resistance.** In compliance with 3.3.4 the watch shall be tested for waterproofness by immersing it completely for at least five minutes in distilled water containing a wetting agent of approximately 1% by weight at room temperature and atmospheric pressure of 15 pounds per square inch (1 atmosphere) for five minutes. For

an additional five minutes the watch shall be immersed under a pressure of 44 pounds per square inch (3 atmospheres).

The watch interior shall then be inspected for moisture by placing on a heating element at  $105 \pm 2^\circ\text{F}$  ( $40.6 \pm 1^\circ\text{C}$ ) for five minutes, then placing several drops of  $70 \pm 2^\circ\text{F}$  ( $21 \pm 1^\circ\text{C}$ ) water on the center of the crystal. Any visible condensed water (fogging) on the inside of the crystal constitutes failure of this test

**4.7.26 Contamination, long term (qualification only).** Ten watches, packaged in accordance with 5.1.2 and held in storage for a period of not less than 90 days, shall be subjected to the test in 4.7.2.3.1, shall pass the requirement stated in 3.3.12.2.

**4.7.27 Long term accuracy (qualification only)** The test shall only be conducted on watches submitted in conformance with 4.3 to determine compliance with 3.3.13. Each watch shall have met all other qualification requirements and tests herein prior to being subjected to the long term accuracy test. The test shall be conducted at  $75 \pm 3^\circ\text{F}$  ( $23.9 \pm 1.7^\circ\text{C}$ ) for a total running time of 90 days, half of which time shall have been in a dial-up and half in a crown-down position, alternated at seven (7) day intervals. In consideration of the normal work week of testing personnel, testing need not be continuous. The watches shall be wound daily and shall be alternated and tested as specified in 3.3.13 to obtain approximately half the operating time (45 days) in each position. Compliance with long term accuracy specified in 3.3.13 shall be determined by using a master time source accurate to within  $\pm .025$  seconds a day, to record the average mean daily rate (see 6.5.6) for compliance with 3.3.13. The mean daily rate (see 6.5.6) for any "individual" watch tested shall meet the accuracy specified in 3.3.13 for mean daily rate

**4.7.28 Altitude, type 6** Watches shall be subjected to air pressure equivalent to that experienced at 35,000 feet for 60 minutes and shall show no evidence of physical damage and shall be subjected to accuracy test for conformance to 4.6.1

**4.7.29 Salt fog, type 6** Watches shall be subjected to the Salt Fog test, Method 509.3, MIL-STD-810, for 48 hours. Upon completion of exposure to salt fog, the watches shall be rinsed and allowed to dry for 48 hours prior to examination. Watches shall show no evidence of damage to the crystal and shall be operational

**4.7.30 Human perspiration resistance, type 6** Watches shall be immersed in a saturated sodium chloride solution containing 5% (by volume) lactic acid (65 strength) at  $91 \pm 1^\circ\text{C}$ . Watches shall be air dried (2 hours) in ambient air. The watches shall then be suspended for 20 hours in an air-tight chamber containing an atmosphere produced by a 50% solution of acetic acid.

**4.7.31 Elapsed time ring, type 6** The elapsed time ring shall be examined for conformance to Figure 5

**4.7.31.1 Torque** The elapsed time ring shall move only when subjected to a torque, applied clockwise and counterclockwise, of  $26 \pm 6$  inch ounces.

4.7.31.2 Displacement. With the index (triangle) at the 3 o'clock position of the dial, a force of  $10 \pm 1/2$  pound shall be applied to the lower side of the elapsed time ring without the ring being damaged or separating from the case.

4.8 Movement design inspection. Manufacturer data on movement design shall be forwarded to the Government activity identified in 6.10.

## 5 PACKAGING.

5.1 Packaging. Packaging shall be level A or C, as specified (6.2).

### 5.1.1 Level A.

5.1.1.1 Unit packaging. Each wrist watch shall be wrapped in neutral tissue paper. The wrist strap shall be wrapped around the watch and cushioned to prevent damage to the instrument. Type 3 watch shall have the stem

maintained in the setting position (battery disconnected) by a removable spacer or shim while in the package. Each watch, wrapped and cushioned shall be packaged in a paperboard box conforming to PPP-B-676 or PPP-B-566. The box shall be closed as specified in the appendix to the applicable box specification.

5.1.1.2 Intermediate packaging. Ten unit packages of wrist watches shall be intermediately packaged in a fiberboard box conforming to PPP-B-636, class domestic.

5.1.2 Level C. Wrist watches shall be packaged to afford adequate protection against damage during shipment from the supply source to the first receiving activity.

5.2 Packing. Packing shall be level A, B, or C, as specified (6.2).

5.2.1 Level A. The packing shall be in accordance with group 1, Level A of PPP-T-360.

5.2.2 Level B. Six intermediate packages (60 watches) shall be packed in a close fitting fiberboard box conforming to PPP-B-636, class weather-resistant. Closure of the fiberboard box shall be in accordance with the appendix of PPP-B-636.

5.2.3 Level C. Wrist watches in quantities as specified (6.2), packaged as specified in 5.1.2, shall be packed in containers to assure carrier acceptance and safe arrival at destination in compliance with Uniform Freight Classification Rules or National Motor Freight Classification Rules.

5.3 Operating Instructions. Operating instructions shall be included in each unit package as specified in 3.6.

5.3.1 Disposal instructions Type 2 thru 5. Disposal instructions shall be included in each unit package, printed on 20 pound white sulphite paper, four inches by 1-1/2 inches. This may be included as part of the operating instructions. The instruction shall be as follows:

DO NOT ATTEMPT TO REPAIR UNSERVICEABLE WATCHES:  
CONTACT YOUR UNIT SUPPLY ACTIVITY TO OBTAIN  
DISPOSAL INSTRUCTIONS FOR UNSERVICEABLE WATCHES

**5.4 Marking.** In addition to the marking requirements specified in PPP-T-360, the unit package, intermediate package, and shipping container shall be marked with the date of acceptance by the Government

**5.4.1 Radioactive marking** Radioactive marking and labeling shall be as specified in MIL-STD-129, except as follows

a Marking for unit and intermediate packages shall include the lot number.

b. The unit and intermediate packages shall be marked with radioactive symbol, the isotope, and activity present in millicuries. Abbreviations may be used for the isotope,  $H^3$ , and millicuries, mCi.

## 6. NOTES.

(THIS SECTION CONTAINS INFORMATION OF A GENERAL OR EXPLANATORY NATURE THAT MAY BE HELPFUL BUT IS NOT MANDATORY.)

**6.1 Intended use** The intended use, available maintenance and storage of the watch will determine which type watch is required. The following criteria is a guide for watch type selection to match user requirements:

Type 1 Long life (5-10 years), maintainable, nonmagnetic, synchronizable, water resistant, accuracy  $\pm 90$  seconds per month (18 minutes per year).

Type 2 Short life (2 years), nonmaintainable, anti-magnetic, water resistant, accuracy  $\pm 90$  seconds per month (18 minutes per year).

Type 3-5 Short life (2 years), nonmaintainable battery powered, anti-magnetic, water resistant, accuracy  $\pm 21$  seconds per month (4 minutes per year)

Type 6. Long life (5-10 years), maintainable, battery powered, anti-magnetic, water resistant, accuracy  $\pm 21$  seconds per month, high altitude

**6.2 Issue of DODISS** When this specification is used in acquisition, the applicable issue of the DODISS must be cited in the solicitation. (See 2.1.1)

**6.3 Ordering data** Procurement documents should specify the following

- a Title, number, and date of this specification
- b Applicable part or identifying number (see 6.7)
- c Selection of applicable levels of packaging and packing
- d Quantities required in level C packing (5.2.3)

e. **Warranty:** Notwithstanding inspection and acceptance by the Government of supplies furnished under this contract, or any condition of this contract concerning the conclusiveness thereof, the contractor warrants that for two years all watches furnished

under this contract will be free of defects in design material or workmanship and will conform with all requirements of this contract (in conformance with FAR clause 52.246-17).

f. Applicable Inspection Provisions (see 6.4).

6.3.1 Material safety data sheet Since the specification describes a product which contains a hazardous (radioactive) material, a Material Safety Data Sheet shall be prepared in accordance with FED-STD-313. One copy shall be submitted to the contracting officer, address as specified (6.2). In addition, a copy shall be provided to the Military Service or Federal department/agency address in FED-STD-313 of each service or agency that purchased the item.

6.3.2 Disposal of radioactive waste Contractor generated radioactive waste must be disposed of in accordance with federal and state regulations. The provisions of AR 700-64 apply.

6.4 Acceptable quality level (AQL) An AQL applicable to Tables III through IV is 1.0 (percent defective) and to Table II would be 0 regardless of lot size.

6.5 Acquisition strategy recommended for quartz analog watches Establish a multiyear contract with delivery of small quantities of 100 units or less within 30 days and large quantities of 100 to 1,000 units within 45 to 60 days. This will reduce high temperature storage time and stocking cost for a noncritical item.

NOTE. A typical 30 month battery used in a quartz analog watch stored at 120 degrees Fahrenheit would effect a loss of approximately 10% of its capacity in 30 days reducing the battery runable life to six months.

6.6 Definitions of terms used

6.6.1 Accuracy error notation Where algebraic signs are used to denote the direction of timekeeping accuracy error, the plus (+) sign represents "fast" and the minus (-) sign "slow."

6.6.2 Error Algebraic time difference in seconds between the watch being tested and the master timepiece.

6.6.3 Starting error Error at start of test period.

6.6.4 Rate Difference between the starting error and error at the end of a given time interval.

6.6.5 Daily rate Rate in a 24 hour period. The term "daily rate" is used synonymously with the term "daily error" and "daily accuracy."

6.6.6 Mean daily rate Mean daily rate is the arithmetic average of individual daily rates (daily errors) with proper regard to algebraic signs in the summation. Unless otherwise specified, the mean daily rate shall be for three consecutive days operation.



**6.6.7 Average mean daily rate.** This term is used to denote the average of the mean daily rates of two or more timepieces with each individual rate being considered as algebraically positive (+) in the computation

**6 7 Part or Identifying Number (PIN)** The military part number shall consist of the designator "M", the basic specification number, the dash number assigned to the type of number of the watch (see 1.2), case color symbol (see 1 2 and 3.2.6 4) and strap color symbol (see 1.2 and 3.2.8)

M	46374	1	M	B
Military Designator	General Specification	Type Number (See 1 2)	Case Color (See 1 2 and 3 2 5 4)	Strap Color (See 1.2 and 3.2 7)

**6 8 Qualification** With respect to products requiring qualification, awards will be made only for such products, which at the time of award of contract, have been tested and approved for inclusion on the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification, in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the U.S. Army Armament Research, Development and Engineering Center, ATTN SMCAR-BAC-S, Picatinny Arsenal, New Jersey 07806-5000. Information pertaining to qualification of products may be obtained from that activity.

**6 9 Surveillance testing** Samples for testing in accordance with 4 8 should be forwarded to

U.S. Army Armament Research, Development and Engineering  
Center, ATTN SMCAR-BAC-S, Picatinny Arsenal, New  
Jersey 07806-5000

**6 10 Movement design review** Drawings, specifications and associated data, in conformance to 3.2.3.2 4, must be forwarded to the following.

William Langer Plant  
Rolla, North Dakota 58367

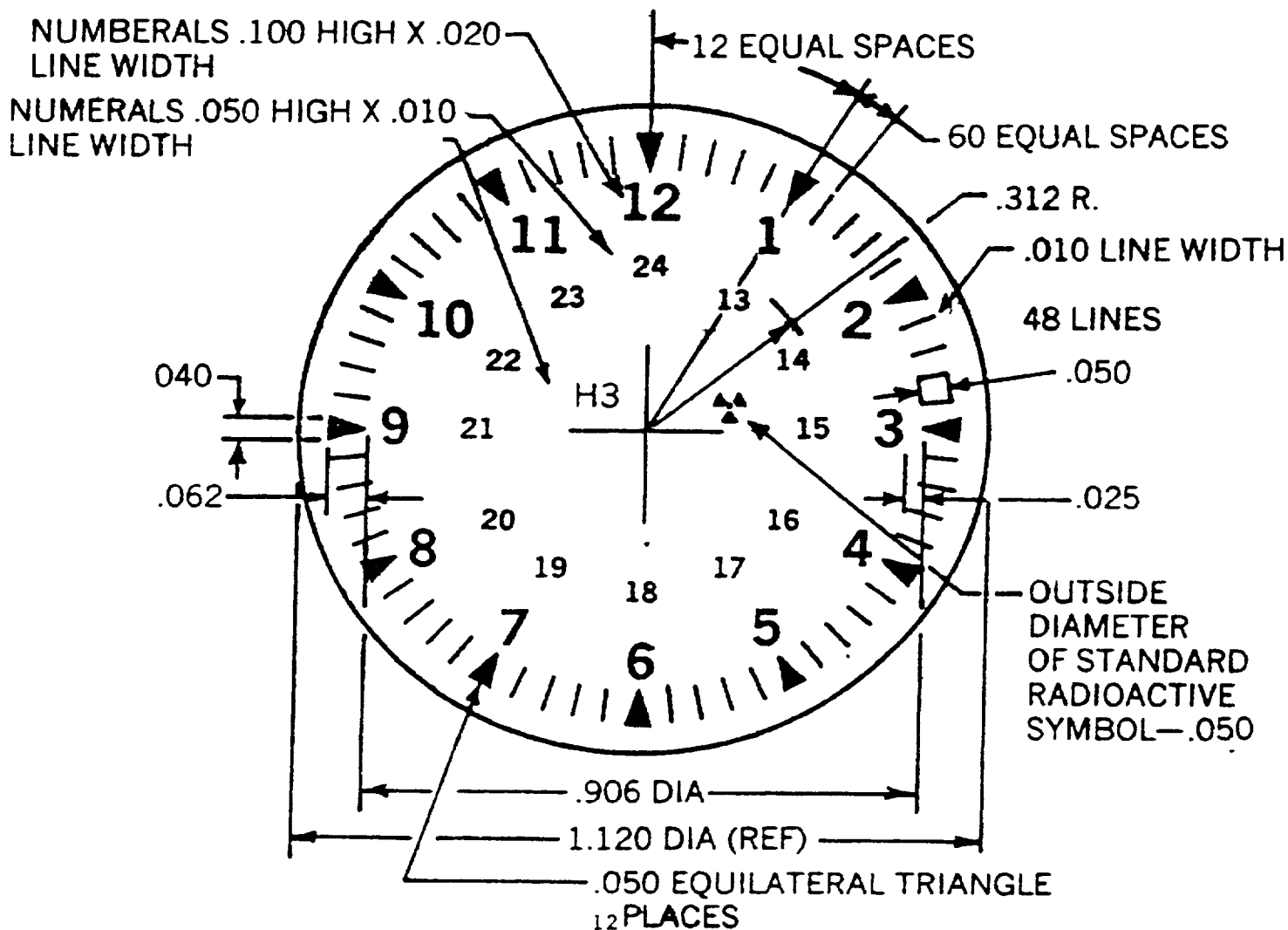
**6.10.1 Jewel bearings.** Jewel bearings for Type 1 and 2 watches are subject to the provisions of FAR Clauses 8.201 and 8.203-1, -2, and -3. Type 2 watches have no specific jewel requirement. However, at the time of qualification watch movements must be identified in accordance with 3.2 3 2 4. Changes in movement design, dimensions, or number of jewels, from that which was originally qualified, must be reported to the Qualifying Activity in order to retain Qualification status.

6 11 Supersession. MIL-W-46374F directly supersedes MIL-W-46374E dated 31 May 1989. The Type 6, Navigators watch is intended to supersede Air Force PD-496B dated 26 February 1985.


6 12 Subject term (key word) listing.

Analog  
Jewel Bearings  
Luminous Vials  
Quartz Movement  
Scintillation counter  
Tritium

6 13 Changes from previous issue Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes

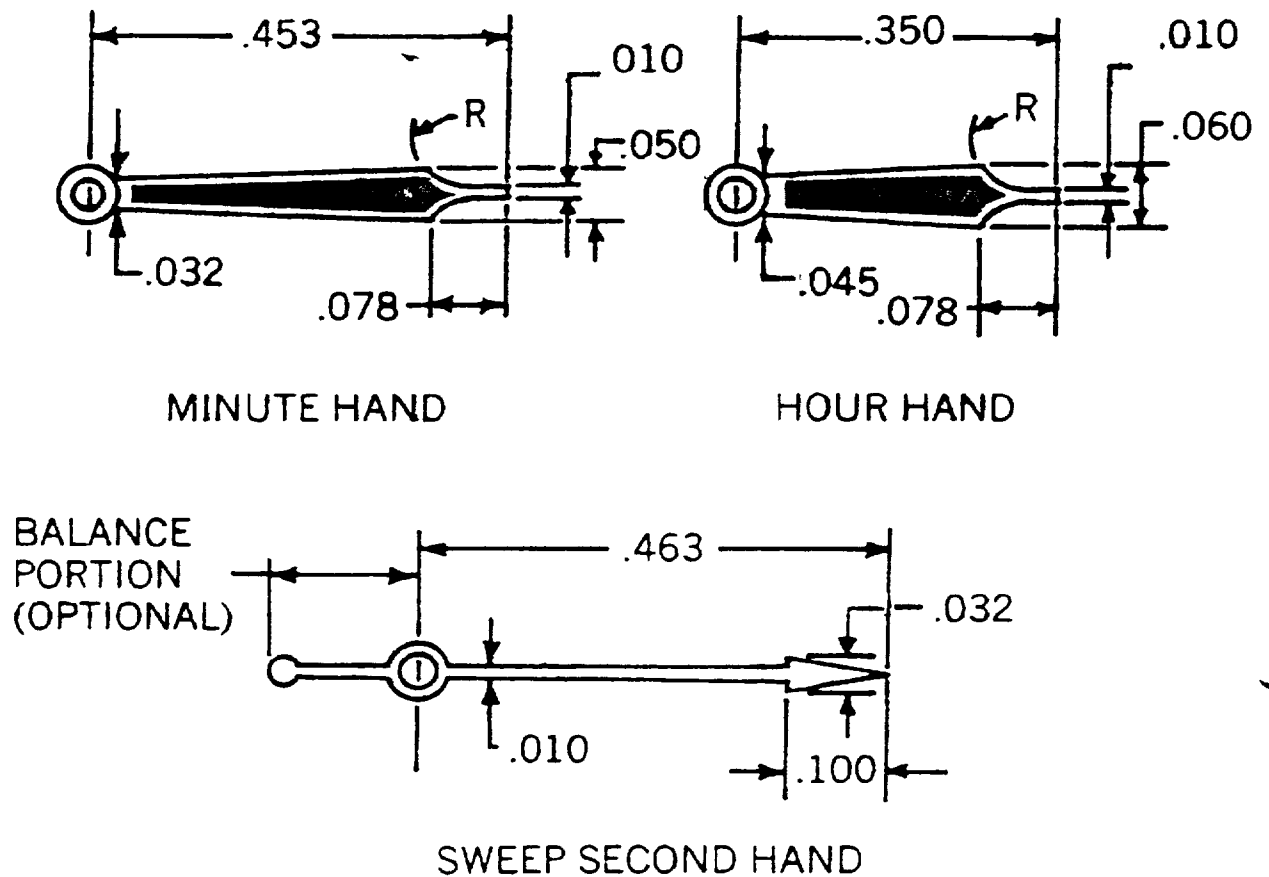


#### NOTES

- 1 Dial face background in accordance with FED-STD-595 Color Black No 37038
- 2 Numbers and graduations in accordance with FED-STD-595 Color White No 37875
- 3 All triangles are luminescent green and indicate positions for luminous vials.
- 4 H3 and  shall be centrally located and clearly visible.

NOTE: Unless otherwise specified, dimensions are in inches and are for reference only.

FIGURE 1

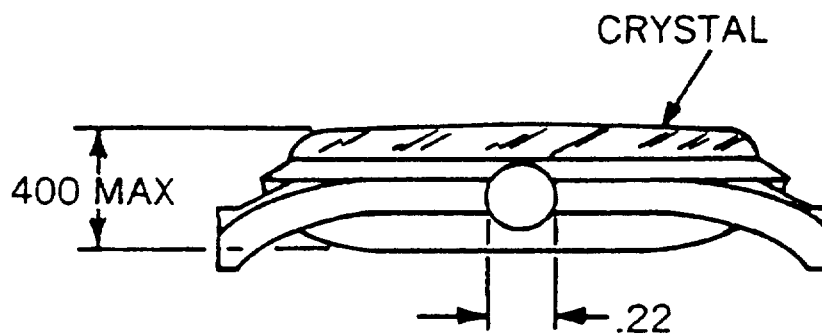
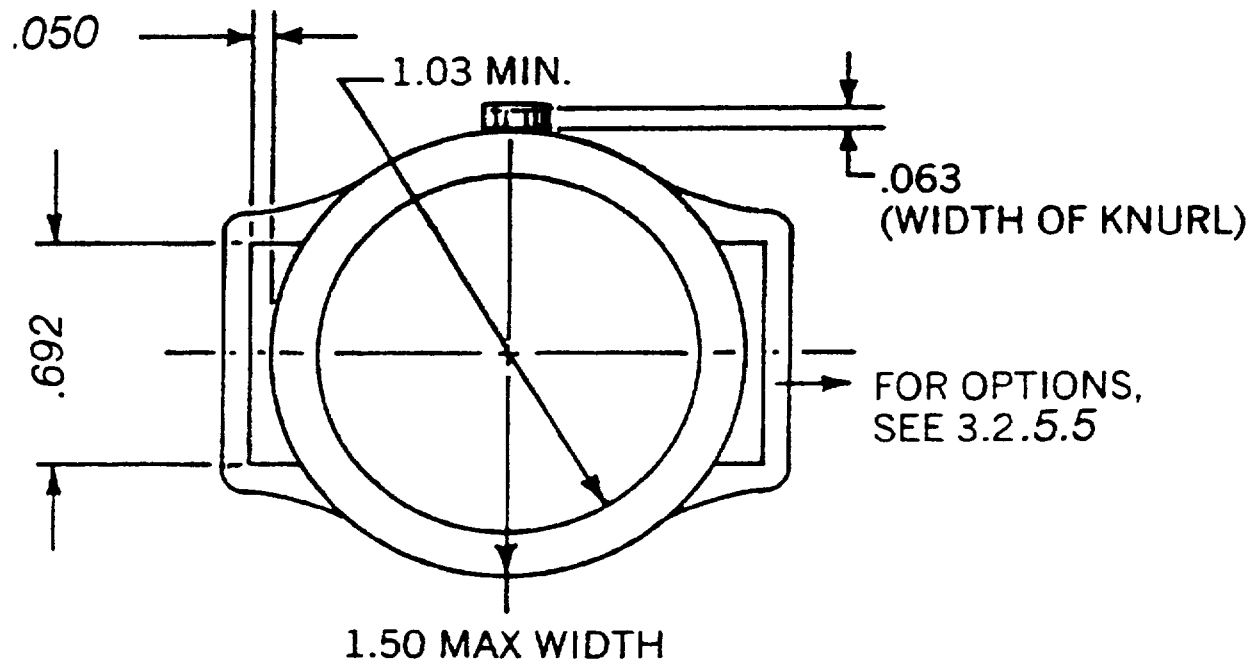


## NOTES

- 1 Shaded areas of hands to be luminescent green
- 2 Hour and minute hand skeletons to be in accordance with FED-STD-595, Color White No 37875
- 3 Thickness of skeletons .008
- 4 Unshaded areas to be in accordance with FED-STD-595, Color White No 37875
- 5 Variations will be considered See 3 2

NOTE: Unless otherwise specified,  
 dimensions are in inches and  
 are for reference only.

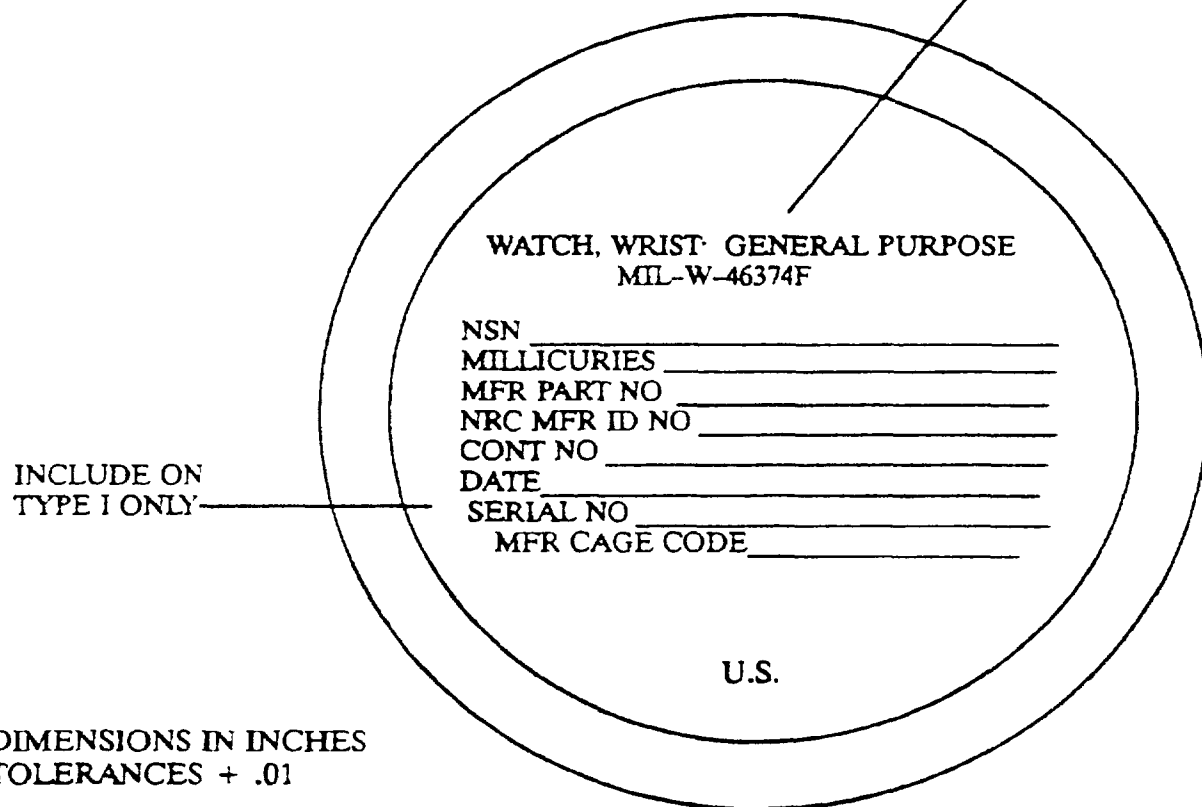
FIGURE 2



NOTE: Unless otherwise specified, dimensions are in inches and are for reference only

FIGURE 3

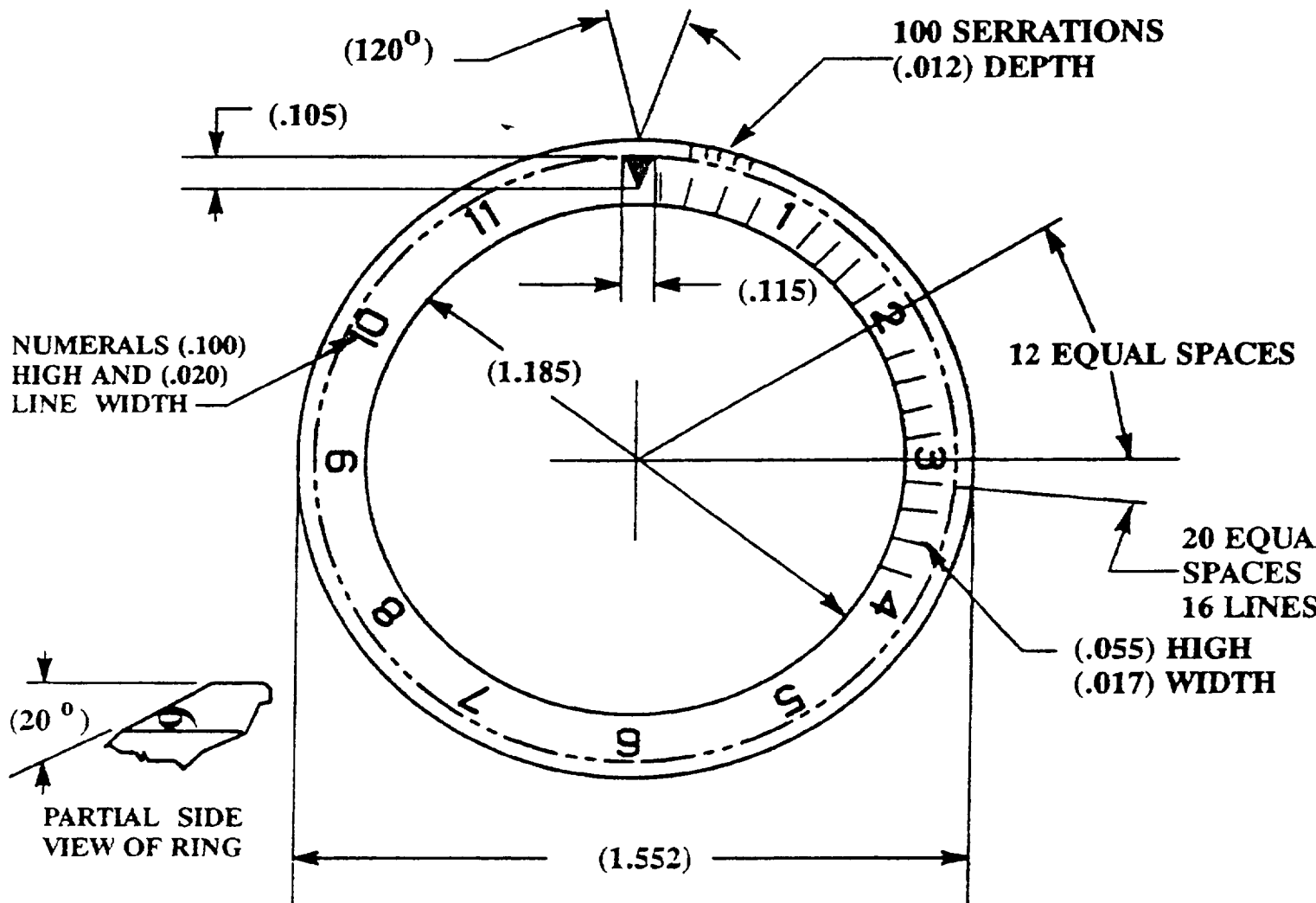
LETTERS AND NUMERALS TO BE .05 (1.270MM)  
HIGH X .010 (.254MM) DEEP CENTRALLY  
LOCATED OR MAY BE POSITIONED AROUND  
THE BEVELED PORTION.  
THE MFR NAME, NATL STOCK NO., CONT NO.,  
AND DATE MAY BE APPLIED WITHOUT THE  
DESCRIPTIVE TITLES.



BACK OF CASE

FIGURE 4

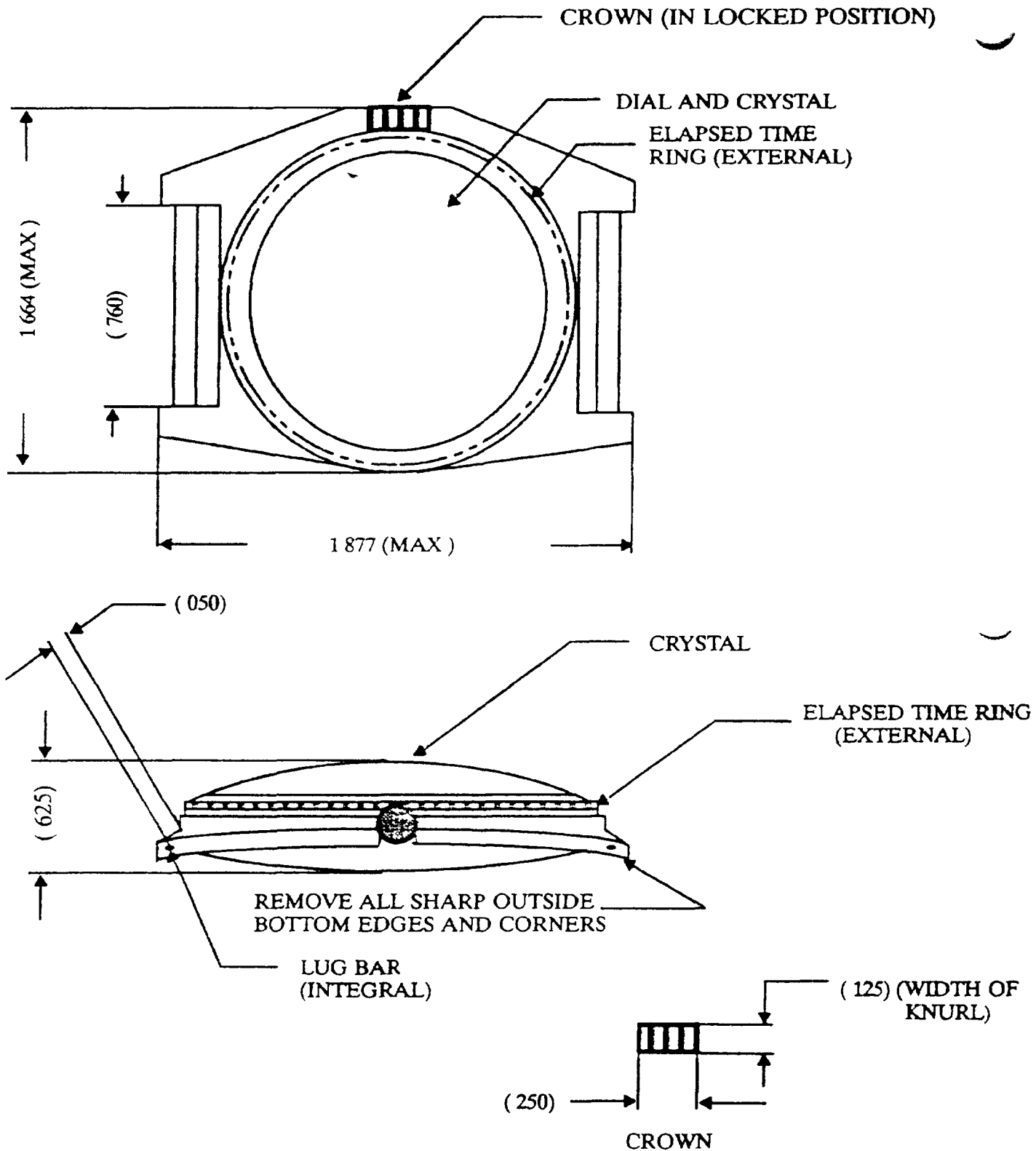




## NOTES:

- 1 BACKGROUND IN ACCORDANCE WITH FED-STD-595, COLOR BLACK NO. 37038.
2. NUMBERS AND GRADUATIONS IN ACCORDANCE WITH FED-STD-595, COLOR WHITE NO. 37875
- 3 SHADED TRIANGLE LUMINOUS GREEN
4. MINUTE GRADUATIONS BETWEEN TRIANGLE AND 4 ONLY.
5. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

FIGURE 5



DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED)

FIGURE 6

CONCLUDING MATERIAL

Custodian:

Army - AR

Navy - SH

Air Force -99

Preparing activity:

Army - AR

Project 6645-0397

Review activities

Air Force - 82

DLA - GS

User activity

Navy - MC

Civil Agencies Coordinating Activities

GSA - FSS

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

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1. RECOMMENDATION CHANGE	1. DOCUMENT NUMBER MIL-W-46374F	2. DOCUMENT DATE (YYMMDD) 911014
--------------------------	------------------------------------	-------------------------------------

3. DOCUMENT TITLE WATCH, WRIST GENERAL PURPOSE

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets if needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER INFORMATION		7. ORGANIZATION	
8. ADDRESS (Include Zip Code)		9. TELEPHONE (Include Area Code)	
		(1) Commercial (2) AUTOVON	

8. PREPARING ACTIVITY

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PICATINNY ARSENAL, NJ 07806-5000

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5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3468  
Telephone (703) 756-2340 AUTOVON 289-2340